

U.S. DEPARTMENT OF COMMERCE, PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER
33082R116TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371U.S. APPLICATION NO. (if known,
see 37 CFR 1.5)

10/048012

INTERNATIONAL APPLICATION NO.
PCT/JP00/04987INTERNATIONAL FILING DATE
July 26, 2000PRIORITY DATE CLAIMED
July 26, 1999

TITLE OF INVENTION

TRANSFER SYSTEM FOR OBJECT TO BE PROCESSED, AND SEMICONDUCTOR FABRICATING SYSTEM WITH SAME

APPLICANT(S) FOR DO/EO/US ---Hiroaki Saeki, et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(l)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(l).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau)
 - b. ☒ has been transmitted by the International Bureau (see Form 308)
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2))
 - ☒ Amendments to the claims of the International Application under PCT Article 34
 - a. ☒ are transmitted herewith (required only if not transmitted by the International Bureau)
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made
 - ☒ A translation of the amendments to the claims under PCT Article 34 (35 U.S.C. 371(c)(3)).
- ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
- ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 34

Items 11. to 16. below concern other document(s) or information included:

1. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98. (w/ copy of PTO-1449 and each reference cited therein and Int'l Search Rept)
2. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
3. ☐ A FIRST preliminary amendment.
4. ☐ A SECOND or SUBSEQUENT preliminary amendment.
5. ☐ A substitute specification.
6. ☐ A change of power of attorney and/or address letter.
7. ☒ Other items or information:

- a) Cover sheet of PCT Publ. WO 01/08211 with International Search Report (PCT/ISA/210) in English;
- b) Translation of Amendment (June 15, 2001) Under Article 34 of PCT including claims to be prosecuted and drawing set;
- c) Notification Concerning Submission or Transmittal of Priority Document (Form PCT/IB/304);
- d) Formal Drawings (included with application) and a Proposed Drawing Amendment with 2 sheets of amended drawings with red corrections shown (Fig. 6 and Fig. 8)
- e) Preliminary Examination Report (Form PCT/IPEA/409 and PCT/IPEA416) in Japanese
- f) Form PCT/IPEA/401 (in Japanese)
- g) Notification of Receipt of Record Copy (Form PCT/IB/301)
- h) Formal Drawing Transmittal containing sheets 6/8 and 8/8 with corrections incorporated (on the assumption of approval of the changes in the Proposed Drawing Amendment).

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
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10/048012

17. The following fees are submitted:

CALCULATION

PTO USE ONLY

Basic National Fee (37 CFR 1.492(a)(1)-(5)):

Search Report has been prepared by the EPO or JPO \$890.00
International preliminary examination fee paid to USPTO (37 CFR 1.482) \$670.00
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$760.00
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$970.00
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$96.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

\$890.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.495(e))

\$ -

Claims	Number Filed	Number Extra	Rate		
Total Claims	6- 20 =	0	x \$18.00	\$ -	
Independent Claims	1- 3 =	0	x \$84.00	\$ -	
Multiple dependent claim(s) (if applicable)			+ \$280.00		
TOTAL OF ABOVE CALCULATIONS =				\$ 890.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28).				\$ 0.00	
SUBTOTAL =				\$ 890.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+	\$ -
TOTAL NATIONAL FEE =				\$930.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property.				+	\$ 40.00
TOTAL FEES ENCLOSED =				\$930.00	
				Amount to be refunded	\$
				charged	\$

- a. ☒ A check in the amount of \$930.00 to cover the above fees is enclosed.
b. ☐ Please charge my Deposit Account No. 02-4300 in the amount of \$_____ to cover the above fees. A duplicate copy of this sheet is enclosed.
c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required with respect to any deficiency in the above noted "Basic National Fee", or credit any overpayment to Deposit Account No. 02-4300.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

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Date: January 25, 2002

8/pst

1

Description

TRANSFER SYSTEM FOR OBJECT TO BE PROCESSED,
AND SEMICONDUCTOR FABRICATING SYSTEM WITH SAME

5

Technical Field

The present invention relates generally to a processed-object transfer system for taking objects to be processed (wafers or the like), out of a processed-object carrier, which is provided in a load port unit, to transfer the objects to a system for processing the objects, and a semiconductor fabricating system with the transfer system.

Background Art

As shown in FIG. 8, a wafer transfer system A' constituting a semiconductor fabricating system (not shown) is designed to take wafers U, one by one, out of a wafer carrier C, which is provided on the top face of a load port unit L, to transfer the wafers U to a wafer processing system E and to transfer the wafers U, which have been processed by the wafer processing system E, to the wafer carrier C again. At this time, if dust adheres to the wafers U, the wafers U are easy to be defective. In order to prevent this, a clean air supply system 4 is provided in the upper portion of the wafer transfer system A' for always supplying clean air K from the unit 4 to the wafers U. This clean air K is blown from top to bottom of a wafer transfer robot R constituting the wafer transfer system A'. Dust existing in the wafer transfer system A' is carried toward the bottom by the flow of the clean air K, and exhausted by an exhaust fan 5 which is provided on the bottom portion 1c of a system body 1. Thus, dust is prevented from adhering to the wafers U.

In a conventional wafer transfer system, a ball screw and a control motor are used for linearly reciprocating a wafer transfer robot. Since the distance of the movement of the wafer transfer robot can not so long in the case of the ball screw, a wafer transfer system for linearly reciprocating the wafer transfer robot by means of a linear motor has been developed.

Referring to FIG. 8, a wafer transfer system A' using a linear motor M will be described below. In a case where the linear motor M is used, the secondary side 11 of the motor M is usually mounted on the bottom portion 1c of the system body 1. However, in this case, the portion of the exhaust fun 5 is covered with the secondary side 11 of the linear motor M, so that there is a problem in that exhaust efficiency deteriorates. In addition, since the wide area of the secondary side 11 of the linear motor M faces upwards, dust is easy to be deposited on the top face of the secondary side 11, and this dust is sometimes carried by the flow of the clean air K to float. In such a case, dust is easy to adhere to the wafers U, so that the rate of occurrence of defective wafers U rises.

The load port unit L is mounted on the outside of the front wall of the system body 1, and the wafer carrier C is provided on the top face of the load port unit L. By mounting the linear motor M on the bottom portion 1c of the system body 1, the distance between the wafer transfer robot R, which is provided on the linear motor M, and the wafer carrier C is long, and a large number of members exist between the wafer carrier and the wafer transfer robot R. As a result, production errors in the members accumulate, so that there is a problem in that the wafer transfer robot R can not precisely position the wafers in the wafer carrier C.

In a system of this type, there are some cases where the wafer transfer robot R is emergency-stopped in view of safety work during the operator's maintenance and inspection work. In the case of the conventional wafer transfer system A', it is possible to emergency-stop the wafer transfer robot R with a relatively simple construction by incorporating an electromagnetic brake or the like in the control motor for driving the ball screw. However, in the case of the linear motor M, it is very difficult to incorporate the above described electromagnetic brake or the like.

Means for stopping the wafer transfer robot R using the linear motor M will be described below. In the control circuit for the linear motor M, a regenerative braking is incorporated. By operating the regenerative braking, the wafer transfer robot

R can be stopped at a predetermined position. In this control circuit, an uninterruptive power supply is also incorporated. Therefore, if the wafer transfer robot R intends to travel due to inertia when the feeding of power is interrupted by an interruption of the power supply or the like, the feeding of power can continue for a set-up time which is set in the uninterruptive power supply. Then, the regenerative braking is operated within the set-up time to stop the wafer transfer robot R. However, there are some cases where the wafer transfer robot travels due to inertia so as not to be stopped even if the set-up time of the uninterruptive power supply elapses. There is the possibility that this malfunction may quite similarly occur even if an emergency stop switch for interrupting the feeding of power to the wafer transfer system A is operated in an emergency.

DISCLOSURE OF THE INVENTION

In view of the above described malfunction, it is an object of the present invention to prevent dust from adhering to an object to be processed, and to surely stop a processed-object transfer robot during an interruption of the power supply or in an emergency.

In order to accomplish the aforementioned object, according to a first aspect of the present invention, there is provided a processed-object transfer system for transferring an object to be processed, while taking the object out of a processed-object carrier which is provided on the top face of a load port unit, the processed-object transfer system comprising: a system body; a linear motor which is provided so as to extend in lateral directions of the system body; and a processed-object transfer robot which is mounted on a primary or secondary side of the linear motor and which is capable of linearly reciprocating in longitudinal directions of the linear motor, wherein the load port unit is mounted on the outside of a front wall of the system body, and the linear motor is mounted in vertical directions inside of the front wall of the system body.

According to a second aspect of the present invention,

there is provided a processed-object transfer system for transferring an object to be processed, while taking the object out of a processed-object carrier which is provided on the top face of a load port unit, the processed-object transfer system comprising: a system body; a linear motor which is provided so as to extend in lateral directions of the system body; a processed-object transfer robot which is mounted on a primary or secondary side of the linear motor and which is capable of linearly reciprocating in longitudinal directions of the linear motor; and a braking device including: a movable body which is mounted on one of the primary and secondary sides of the linear motor, the movable body being absorbed by a magnetic attraction of a coil, which is included in the one of the primary and secondary sides, against a resilient restoring force of a compression spring acting in the opposite direction to the magnetic attraction; and a brake plate which is mounted on the other side of the primary and secondary sides of the linear motor so as to face the movable body, said brake plate being contacted pressingly with said movable body by interrupting the feeding of power to said coil.

According to the first aspect of the present invention, the primary or secondary side of the linear motor, which is provided inside of the front wall of the system body so as to extend in lateral directions, is mounted in vertical directions. Dust dropping in the system body is directly exhausted by the exhaust fan which is provided on the bottom portion. Since the narrow surface faces upwards, the amount of dust deposited on the top face of the primary or secondary side of the linear motor is very small. In addition, since the narrow surface faces upwards, the air flow in the system body hardly reaches the top face of the primary or secondary side, so that deposited dust does not float in the system. As a result, dust is prevented from adhering to the object to be processed, so that the object in the system body is always transferred in a clean state. In addition, the distance between the processed-object transfer robot provided on the linear motor and the processed-object carrier decreases, and the number of members provided between the wafer carrier and the processed-object transfer robot

decreases, so that the processed-object transfer robot can precisely position the object in the processed-object carrier.

According to the second aspect of the present invention, the braking device is mounted on the processed-object transfer system. Therefore, when an interruption of the power supply occurs to interrupt the feeding of power to the processed-object transfer system, the magnetic attraction of the coil for causing the movable body, which is mounted on one of the primary and secondary sides of the linear motor, to be spaced from the brake plate provided on the other side is released. The movable body approaches the brake plate by the resilient restoring force of the compression spring to pressingly contact the brake plate. At this time, the traveling of the processed-object transfer robot is simultaneously stopped by friction force.

The above described pressing contact of the movable body to the brake plate is always carried out when the feeding of power to the coil is interrupted. Therefore, it is possible to surely stop the traveling of the processed-object transfer robot only by providing an emergency stop switch for interrupting the feeding of power to the coil and by operating the emergency stop switch in an emergency.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a lateral sectional view of a wafer transfer system A according to the present invention;

FIG. 2 is a partially broken-out plan view of the wafer transfer system A;

FIG. 3 is a partially broken-out rear view of the wafer transfer system A;

FIG. 4 is a side view of a wafer transfer robot R;

FIG. 5 is an illustration for explaining the operation of a wafer transferring fork 18 when the fork enters a wafer carrier C;

FIG. 6 is an enlarged side view of a braking device B;

FIG. 7 is an illustration for explaining the operation of the braking device B; and

FIG. 8 is a lateral sectional view of a conventional wafer

transfer system A'.

BEST MODE FOR CARRYING OUT THE INVENTION

Referring now to the accompanying drawings, the preferred
 5 embodiment of a processed-object transfer system according to
 the present invention will be described below in detail. In this
 embodiment, an object to be processed is a wafer, and the
 processed-object transfer system is a wafer transfer system.
 Furthermore, the object should not be limited to the wafer. For
 10 example, the object may be a glass substrate for use in a liquid
 crystal display.

FIG. 1 is a lateral sectional view of a wafer transfer
 system A according to the present invention, and FIG. 2 is a
 partially broken-out plan view of the wafer transfer system A.
 15 FIG. 3 is a partially broken-out rear view of the wafer transfer
 system, and FIG. 4 is a side view of a wafer transfer robot R.

As shown in FIGS. 1 through 3, the front wall 1a of a
 box-shaped system body 1 constituting the wafer transfer system
 A according to the present invention has an opening 2 for mounting
 20 therein load port units L. In the opening 2, a plurality of (four
 in this embodiment) load port units L are mounted. On the top
 face of each of the load port units L, a wafer carrier C housing
 therein a plurality of wafers U is provided. On the back face
 of the front wall 1a, a lid attaching/detaching unit F for
 25 attaching/detaching a lid (not shown) of the wafer carrier C is
 mounted. On the back wall 1b of the system body 1, an orienter
 D for setting the direction (the crystallized direction in the
 crystal) of the wafer U and a wafer processing system E having
 wafer processing sections 3 for processing the wafers U are
 30 provided.

First, the wafer transfer system A will be described. In
 the system body 1 of the wafer transfer system A, there is provided
 a wafer transfer robot R for taking the wafers U out of the wafer
 carrier C, one by one, to transfer the wafers U to the wafer
 35 processing system E and to transfer the wafers U, which have been
 processed by the wafer processing system E, to the wafer carrier
 C again. In the upper portion of the system body 1, there is

provided a clean air supply system 4 for supplying clean air K to the wafers U which have been taken out of the wafer carrier C. On the substantially whole bottom face 1c of the system body 1, an exhaust fan 5 is provided. On the back wall 1b of the system body 1, a first transfer window 6 and a second transfer window 7 are provided. The first transfer window 6 is a window for feeding the wafers U, which have been taken out of the wafer carrier C by the wafer transfer robot R, to an orienter D and for taking the aligned wafers U out of the orienter D by means of the wafer transfer robot R. The second transfer window 7 is a window for transferring the wafers U to the wafer processing system E by means of the wafer transfer robot R and for taking the processed wafers U out of the wafer processing system E.

Inside of the front wall 1a of the system body 1, struts 8 are provided so as to vertically extend in the substantially central portion and both end portion in lateral directions of the system body 1. On each of the struts 8, a flat fixed base 9 is mounted. The fixed base 9 is mounted so that the longitudinal directions of the fixed base 9 are coincident with the lateral directions (directions perpendicular to the plane of FIG. 1 or lateral directions in FIG. 2) of the system body 1 and so that the lateral directions (up and down directions in FIG. 1) of the fixed base 9 viewed from the side are coincident with the vertical directions of the system body 1 (in other words, the fixed base 9 is disposed vertically viewed from the side). On the substantially central portion of the fixed base 9 in vertical directions, the secondary side 11 of the linear motor M is mounted. The secondary side 11 is flat, and the length thereof is slightly shorter than the length of the system body 1 in lateral directions. The secondary side 11 of the linear motor M is mounted on the back face of the fixed base 9 (on the opposite side to the struts 8) so that the lateral directions (vertical directions in FIG. 4) of the secondary side 11 viewed from the side are coincident with the vertical directions of the system body 1. That is, similar to the fixed base 9, the secondary side 11 of the linear motor M is mounted so as to extend in vertical directions viewed from the side. In accordance therewith, the primary side 12 of

the linear motor M also extends in vertical directions.

To the back face of the fixed base 9 above and below the secondary side 11 of the linear motor M, a pair of guide rails 13 are fixed so as to extend in lateral directions of the system body 1. On each of the pair of guide rails 13, a guide body 14
 5 is mounted. On the back faces of the guide bodies 14 and primary side 12, a movable base 15 is mounted. On the back face of the movable base 15, the wafer transfer robot R is mounted. Therefore, the wafer transfer robot R can linearly reciprocate in lateral
 10 directions of the system body 1 by operating the linear motor M.

The wafer transfer robot R will be described below. As shown in FIGS. 4 and 5, the wafer transfer robot R comprises a robot body portion 16 which is mounted on the movable base 15,
 15 and a wafer handling portion 17 which is provided on the top of the robot body portion 16 and which is designed to enter the wafer carrier C to take the wafers U off. On the wafer handling portion 17, a wafer transferring fork 18 for transferring the wafers U is mounted. The wafer transferring fork 18 is retractable by a
 20 linkage comprising a plurality of link members 19. The wafer handling portion 17 is pivotable about the vertical axis CL of the robot body portion 16.

The movable base 15 is mounted on the robot body portion 16 via a base plate 21. On the base plate 21, a ball screw 22,
 25 a guide rail (not shown) and a control motor 23 are provided so as to extend vertical directions. By operating the control motor 23 to rotate the ball screw 22 in a predetermined direction, the robot body portion 16 can be vertically moved. In FIG. 3, reference numbers 24 and 25 denote wire housing members for
 30 housing therein wires for feeding power to the control motor 23.

The braking device B provided in the wafer transfer system A will be described below. As shown in FIGS. 6 and 7, a movable body mounting portion 26 is provided on the bottom of the movable base 15 so as to extend therefrom, and a brake plate 27 facing
 35 the movable body mounting portion 26 is provided on the bottom of the fixed base 9 so as to extend therefrom. The brake plate 27 is made of, e.g., an aluminum plate, and extends substantially

over the whole length of the fixed base 9. On the movable body mounting portion 26, a movable body 28 of iron is mounted. On the upper and lower portions of the back face of the movable body 28, two coils 29 are provided. On the substantially central portion of the back face of the movable body 28, a compression spring 31 is resiliently mounted. If power is fed to the two coils 29, magnetic attraction is generated, so that the movable body 28 is mounted by the magnetic attraction. This magnetic attraction acts in the opposite direction to the resilient restoring force of the compression spring 31, and is greater than the resilient restoring force. Therefore, when power is fed to the two coils 2, the movable body 28 is absorbed onto the two coils 29 against the resilient restoring force of the compression spring 31. At this time, a small gap e is formed between the brake plate 27 and the movable body 28, so that the wafer transfer robot R is linearly moved without any obstacles.

When the feeding of power to the two coils 29 is interrupted, the magnetic attraction of each of the coils 29 disappears. The movable body 28 is pushed out toward the brake plate 27 by the resilient restoring force of the compression spring 31 to pressingly contact the brake plate 27. As a result, friction force is generated between the brake plate 27 and the movable body 28, so that the traveling of the wafer transfer robot R is stopped. Since the above described pressing contact is carried out substantially simultaneously with the interruption of the feeding of power to the two coils 29, the traveling of the wafer transfer robot R is simultaneously stopped.

The operation of the wafer transfer system A according to the present invention will be described below. As shown in FIGS. 1 through 3, the wafer carrier C is mounted on the load port unit L which is provided on the front wall 1a of the system body 1. Subsequently, the lid (not shown) of the wafer carrier C is removed by the lid attaching/detaching unit F which is provided on the load port unit L. The wafer transfer robot R linearly moves in lateral directions of the system body 1, and vertically moves to a predetermined height to face the wafer carrier C. By means of the linkage comprising the plurality of link members 19, the

wafer transferring fork 18 moves forwards to enter the wafer carrier C. This state is shown by a two-dot chain line in FIG. 5. A wafer U is supported on the wafer transferring fork 18, and then, the wafer transferring fork 18 is retracted, so that only one wafer U is taken out. Furthermore, a plurality of wafers may be simultaneously taken out by means of a multistage wafer transferring fork.

At this time, clean air K is always supplied downwards from the clean air supply system 4 which is provided in the system body 1. Therefore, clean air K is always supplied to the wafer U which has been taken out of the wafer carrier C by means of the wafer transferring fork 18, so that no dust adheres to the wafer U. In addition, dust floating in the system body 1 drops in accordance with the flow of the clean air K. Since the exhaust fan 5 is provided on the bottom portion 1c of the system body 1, the floating dust is directly sucked into the exhaust fan 5 to be exhausted. In the wafer transfer system A according to the present invention, the fixed base 9 and the secondary side 11 of the linear motor M are mounted in vertical directions. Therefore, the amount of the dust deposited on the top faces of the fixed base 9 and the secondary side 11 of the linear motor M is very small. In addition, the flow of the clean air K supplied from the clean air supply system hardly reaches the top faces of the fixed base 9 and the secondary side 11. As a result, the dust does not rise in the system body 1, so that the wafer U is always held in a clean state.

Then, while the wafer U is supported on the wafer transferring fork 18, the wafer handling portion 17 of the wafer transfer robot R rotates about the vertical axis CL of the robot body portion 16 to face the orienter D. The direction of the wafer U is defined by the orienter D. Subsequently, while the wafer U is supported on the wafer transferring fork 18, the wafer transfer robot R linearly moves in lateral directions of the system body 1 again and vertically moves to a predetermined height to face the second transfer window 7. The wafer U is transferred to the wafer processing section 3 of the wafer processing system E in which a predetermined process is carried out. The processed

wafer U is mounted on the wafer transferring fork 18 of the wafer transfer robot R which has been previously moved to a position facing the second transfer window 7. The wafer transfer robot R linearly moves to cause the processed wafer U to be housed in the wafer carrier C at a predetermined position. By repeating the above described operation, all of the wafers U housed in the wafer carrier C are processed.

The operation of the braking device B will be described below. As shown in FIG. 6 and 7, in a case where the traveling wafer transfer robot R is stopped at a predetermined position (e.g., a position facing the wafer carrier C for taking the wafer C off), i.e., in the case of a usual stopping, the wafer transfer robot R is stopped by operating a regenerative braking which is provided in a control circuit. A case where an interruption of the power supply occurs to interrupt the feeding of power to the wafer transfer system A will be described below. In the case of the wafer transfer system A in this preferred embodiment, an uninterruptive power supply is incorporated in a control circuit (not shown). Therefore, the uninterruptive power supply is operated substantially simultaneously with the interruption of the feeding of power to the wafer transfer system A, so that the feeding of power to the wafer transfer system A continues for the set-up time (e.g., 1 second) of the uninterruptive power supply. Within this set-up time, the regenerative braking is operated to stop the wafer transfer robot R. Even if the wafer transfer robot R intends to travel (inertia-travel) without being stopped within the set-up time due to any causes, if the set-up time of the uninterruptive power supply elapses, the feeding of power to the wafer transfer system A is interrupted. Simultaneously, the feeding of power to the respective coils 29 is also interrupted, so that the magnetic attraction for causing the movable body 28, which is mounted on the movable body mounting portion 26 extending from the movable base 15, to be spaced from the brake plate 27 extending from the fixed base 9 is released. The movable body 28 is pushed out toward the brake plate 27 by the resilient restoring force of the compression spring 31. At this time, friction force is generated between the brake plate

27 and the movable body 28, so that the traveling of the wafer transfer robot R is stopped. Thus, the inertia traveling of the wafer transfer robot R is prevented during an interruption of the power supply or the like, so that the wafer transfer system A is not damaged.

The above described pressing contact of the movable body 28 to the brake plate 27 is always carried out when the feeding of power to each of the coils 29 is interrupted. Therefore, the braking device B may be operated in an emergency. That is, an emergency stop switch (not shown) is provided in the system body 1 at a predetermined position (e.g., a manual operating panel) so that the feeding of power to each of the coils 29 is interrupted by operating the emergency stop switch without operating the uninterruptive power supply. If only the operator operates the emergency stop switch to interrupt the feeding of power to each of the coils 29 in an emergency, the movable body 28 pressingly contacts the brake plate 27. Thus, the traveling of the wafer transfer robot R can be simultaneously and surely stopped in an emergency. The construction of the braking device B is very simple, and the control thereof is also very simple.

In this preferred embodiment, the secondary side 11 of the linear motor M is mounted inside of the front wall 1a of the system body 1, and the primary side 12 is movable. However, the linear motor M may be reversely mounted in view of the structure of the linear motor M, i.e., the primary side 12 may be mounted inside of the front wall 1a of the system body 1, and the secondary side 11 may be movable. In this preferred embodiment, the linear motor M is mounted on the front wall 1a of the system body 1. However, the linear motor M may be mounted on the back wall 1b of the system body 1 although there is the above described problem on the precision of position.

As described above, according to the preferred embodiment of the present invention, the primary or secondary side of the linear motor M for linearly reciprocating the wafer transfer robot R is mounted so as to extend in lateral directions of the system body 1 and in vertical directions. Therefore, dust dropping in the system body is directly sucked into the exhaust fan 5 to be

exhausted, so that the interior of the system can be always held in a clean state to prevent dust from adhering to the wafer U. As a result, the wafer U can be always held in a clean state without deteriorating the advantages of the linear motor M, so that it is possible to prevent defective wafers from being produced by dust. The distance between the wafer transfer robot R provided on the top of the linear motor M and the wafer carrier C decreases, and the number of members provided between the wafer carrier and the wafer transfer robot decreases, so that the wafer transfer robot R can precisely position the wafers in the wafer carrier C.

The linear motor M for linearly reciprocating the wafer transfer robot R is provided with the braking device for causing the movable body 28 to pressingly contact the brake plate 27 when the feeding of power to the wafer transfer system A is interrupted. Therefore, the traveling of the wafer transfer robot A can be surely stopped during an interruption of the power supply or in an emergency. The construction for causing the movable body 28 to pressingly contact the brake plate 27 comprises the coils 29 and the compression spring 31 which are very simple. The control thereof is also very simple since it is carried out only by interrupting the feeding of power to the coils 29. As a result, it is possible to prevent the inertia traveling of the wafer transfer robot R without deteriorating the advantages of the linear motor M.

If a semiconductor fabricating system is provided with a processing means, such as a deposition system, and the above described wafer transfer system A, it is possible to provide a semiconductor fabricating system capable of removing the influence of dust and surely stopping a processed-object transfer robot during an interruption of the power supply or in an emergency.

TRANSLATION OF AMENDMENT (June. 15, 2001)
UNDER ARTICLE 34 OF PCT

- 5 (1) Claims 5 and 8 are deleted.
(2) Claims 6 is amended to be dependent on claim 4.

Claims

1. A processed-object transfer system for transferring an object to be processed, while taking the object out of a processed-object carrier which is provided on the top face of a load port unit, said processed-object transfer system comprising:

a system body;

a linear motor which is provided so as to extend in lateral directions of said system body; and

a processed-object transfer robot which is mounted on a primary or secondary side of said linear motor and which is capable of linearly reciprocating in longitudinal directions of said linear motor,

wherein said load port unit is mounted on the outside of a front wall of said system body, and said linear motor is mounted in vertical directions inside of said front wall of said system body.

2. A processed-object transfer system as set forth in claim 1, which further comprises an exhaust fan which is provided on the bottom of said system body.

3. A processed-object transfer system as set forth in claim 2, which further comprises a clean air supply system for supplying clean air to said object which is transferred by said processed-object transfer robot, said clean air supply system being provided in an upper portion of said system body.

4. A processed-object transfer system as set forth in claim 1, which further comprises a braking device including:

a movable body which is mounted on one of the primary and secondary sides of said linear motor, said movable body being absorbed by a magnetic attraction of a coil, which is included in said one of the primary and secondary sides, against a resilient

restoring force of a compression spring acting in the opposite direction to said magnetic attraction; and

a brake plate which is mounted on the other side of the primary and secondary sides of said linear motor so as to face said movable body, said brake plate being contacted pressingly with said movable body by interrupting the feeding of power to said coil.

5.(Deleted) A processed-object transfer system for transferring an object to be processed, while taking the object out of a processed-object carrier which is provided on the top face of a load port unit, said processed-object transfer system comprising:

a system body;

a linear motor which is provided so as to extend in lateral directions of said system body;

a processed-object transfer robot which is mounted on a primary or secondary side of said linear motor and which is capable of linearly reciprocating in longitudinal directions of said linear motor; and

a braking device including:

a movable body which is mounted on one of the primary and secondary sides of said linear motor, said movable body being absorbed by a magnetic attraction of a coil, which is included in said one of the primary and secondary sides, against a resilient restoring force of a compression spring acting in the opposite direction to said magnetic attraction; and

a brake plate which is mounted on the other side of the primary and secondary sides of said linear motor so as to face said movable body, said brake plate being contacted pressingly with said movable body by interrupting the feeding of power to said coil.

6.(Amended) A processed-object transfer system as set forth in claim 4, wherein said system body is provided with an emergency stop switch for emergency-stopping a processed-object transfer

[illegible][illegible][illegible]

手続補正書

(法第11条の規定による補正)



特許庁審査官 柴沼 雅樹 殿

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TOKYO 100-0005 Japan

4. 補正の対象 請求の範囲

5. 補正の内容 (1) 請求の範囲第5項、第8項を削除する。
(2) 請求の範囲第6項3行目「請求項5…」を
「請求項4…」に補正する。

6. 添付書類の目録 請求の範囲第12頁、第13頁

請 求 の 範 囲

1. ロードポート装置の上面に設置された被処理体キャリアから被処理体を取り出しながら被処理体を移載するための被処理体移載装置において、

装置本体と、

前記装置本体の幅方向に沿って配設されたりニアモータと、

前記リニアモータの一次側又は二次側に取付けられ、前記リニアモータの長手方向に沿って往復直線移動可能な被処理体移載ロボットと、

を備え、

前記ロードポート装置は前記装置本体の正面壁の外側に装着されており、前記リニアモータは前記装置本体の前記正面壁の内側に縦方向に取り付けられていることを特徴とする被処理体移載装置。

2. 前記装置本体の底面部に、排気ファンが配設されていることを特徴とする請求項 1 記載の被処理体移載装置。

3. 前記装置本体の上部に、前記被処理体移載ロボットにより移載される被処理体に、清浄空気を供給するための清浄空気供給装置が配設されていることを特徴とする請求項 2 記載の被処理体移載装置。

4. 前記リニアモータの一次側又は二次側のいずれか一方側に取付けられ、その一方側に内装されたコイルの磁気吸引力により、該磁気吸引力と反対方向に作用する圧縮ばねの弾性復元力に抗して吸着される可動体と、

前記リニアモータの他方側に、前記可動体と相対向して取り付けられ、前記コイルへの給電が遮断されることにより、該可動体が圧接されるブレーキ板と、

を有するブレーキ装置をさらに備えたことを特徴とする請求項 1 記載の被処理体移載装置。

5. (削除)

6. (補正後) 前記装置本体には、被処理体移載ロボットを非常停止させるための非常停止スイッチが設けられていて、該スイッチを作動させることによって、前記コイルへの給電が遮断されるように構成されていることを特徴とする請求項 4 に記載の被処理体移載装置。

7. 請求項 1 に記載の被処理体移載装置を備えたことを特徴とする半導体製造装置。

8. (削除)

12565202

ABSTRACT

In a wafer transfer system wherein a wafer transfer robot linearly reciprocates by a linear motor, dust is prevented from adhering to a wafer.

A fixed base 9, on which the secondary side 11 of a linear motor M for linearly reciprocating a wafer transfer robot R is mounted, is mounted on the system body 1 of a wafer transfer system A in lateral directions and in vertical directions, so that dust dropping in accordance with the flow of clean air K from a clean air supply system 4 is directly sucked into an exhaust fan 5, which is provided on the bottom portion 1c of the system body 1, to be exhausted without being deposited on the top face of the fixed base 9 and the secondary side 11.

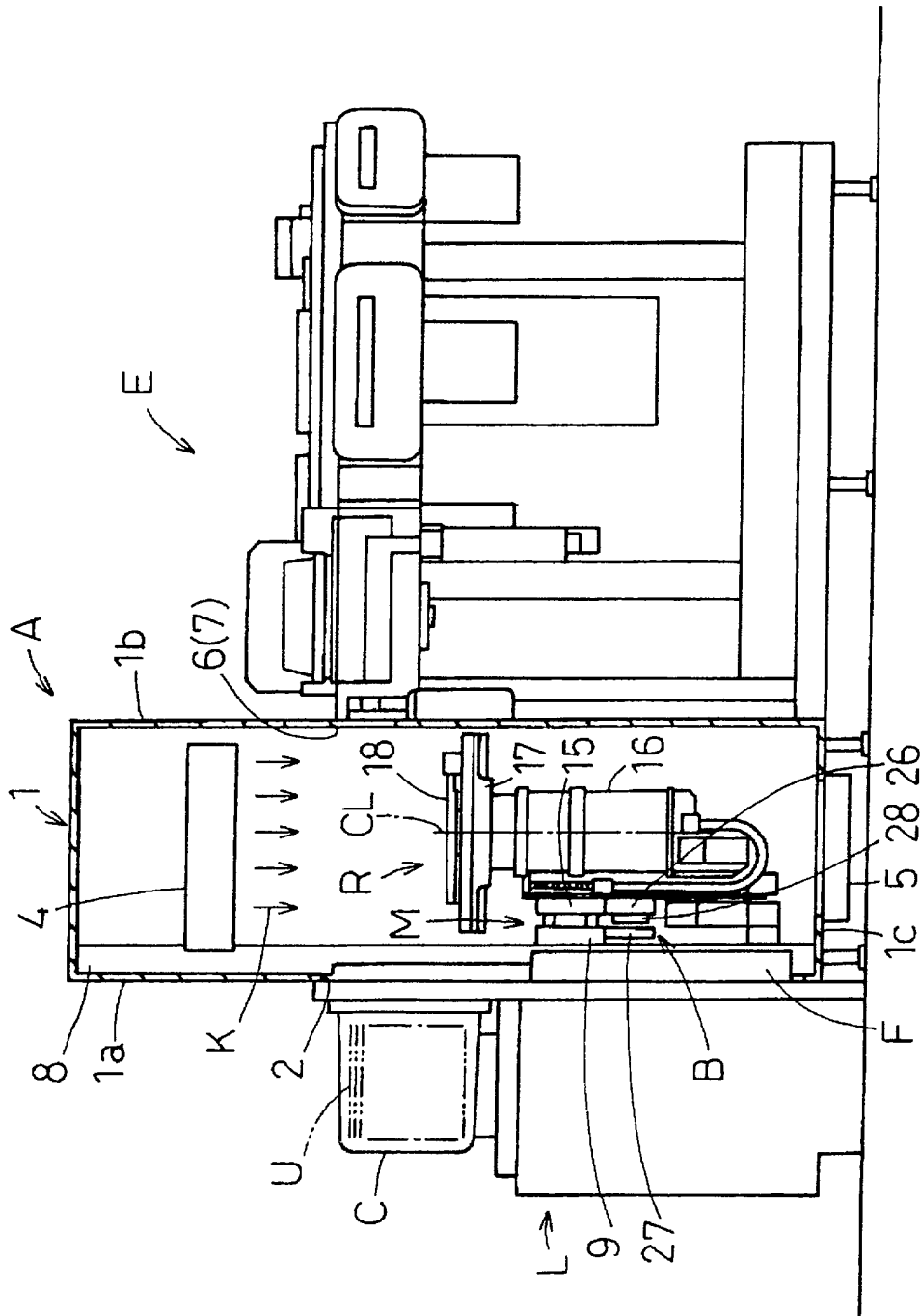


FIG. 1

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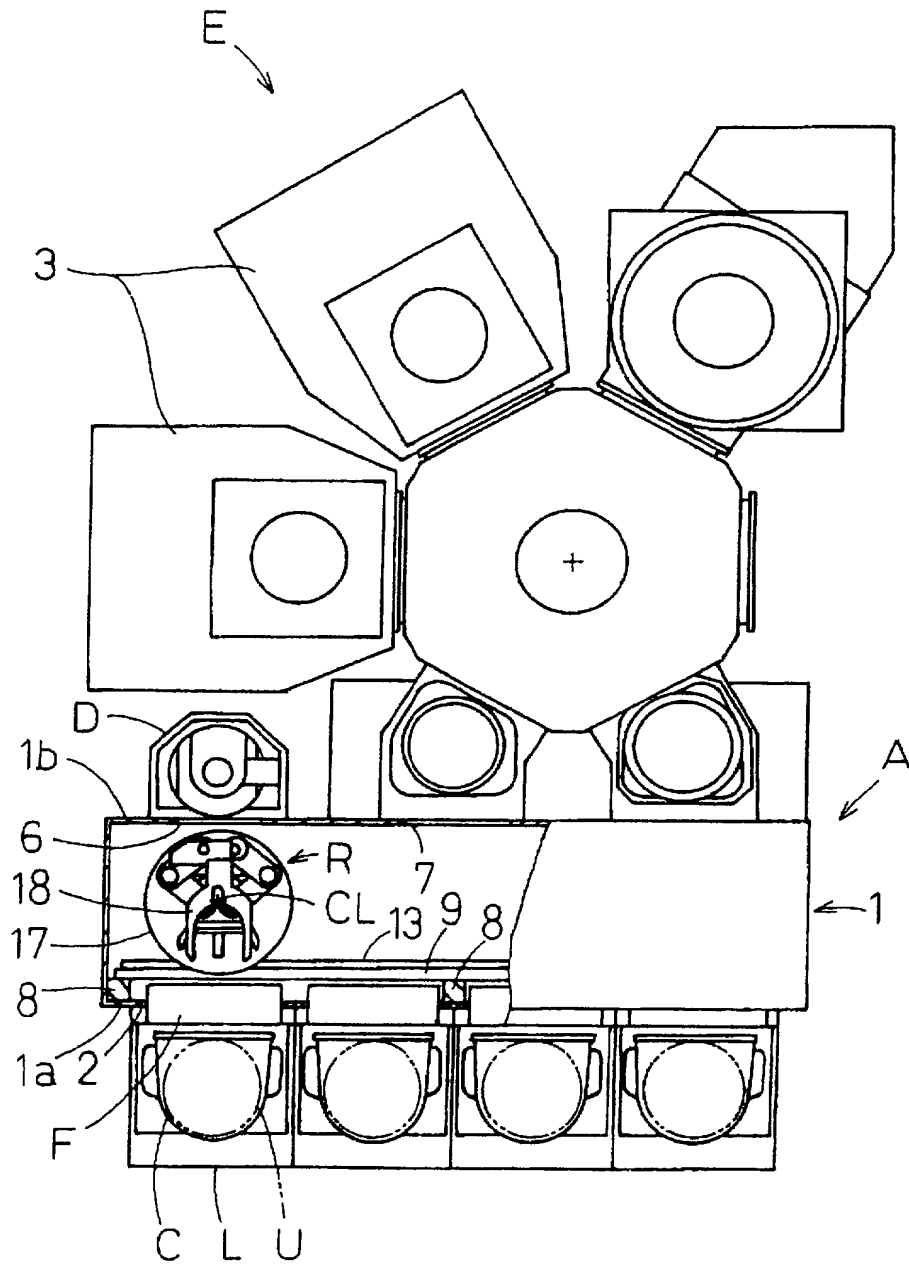


FIG. 2

FIG. 3

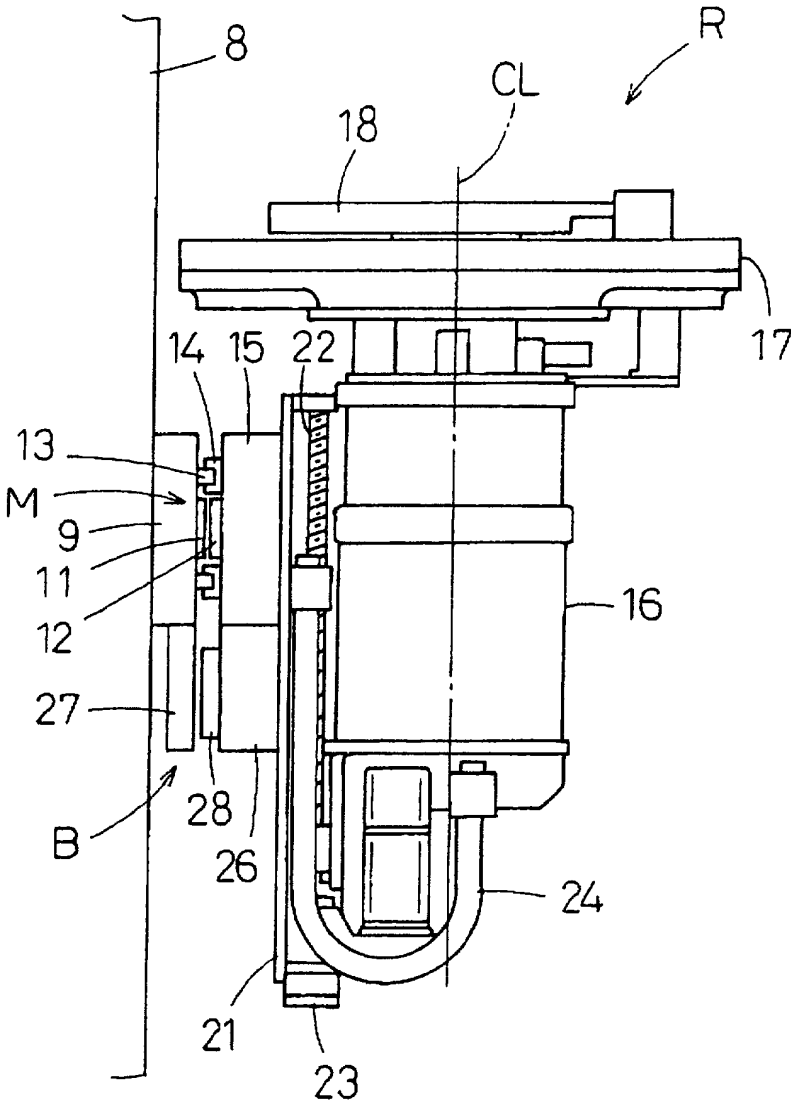


FIG. 4

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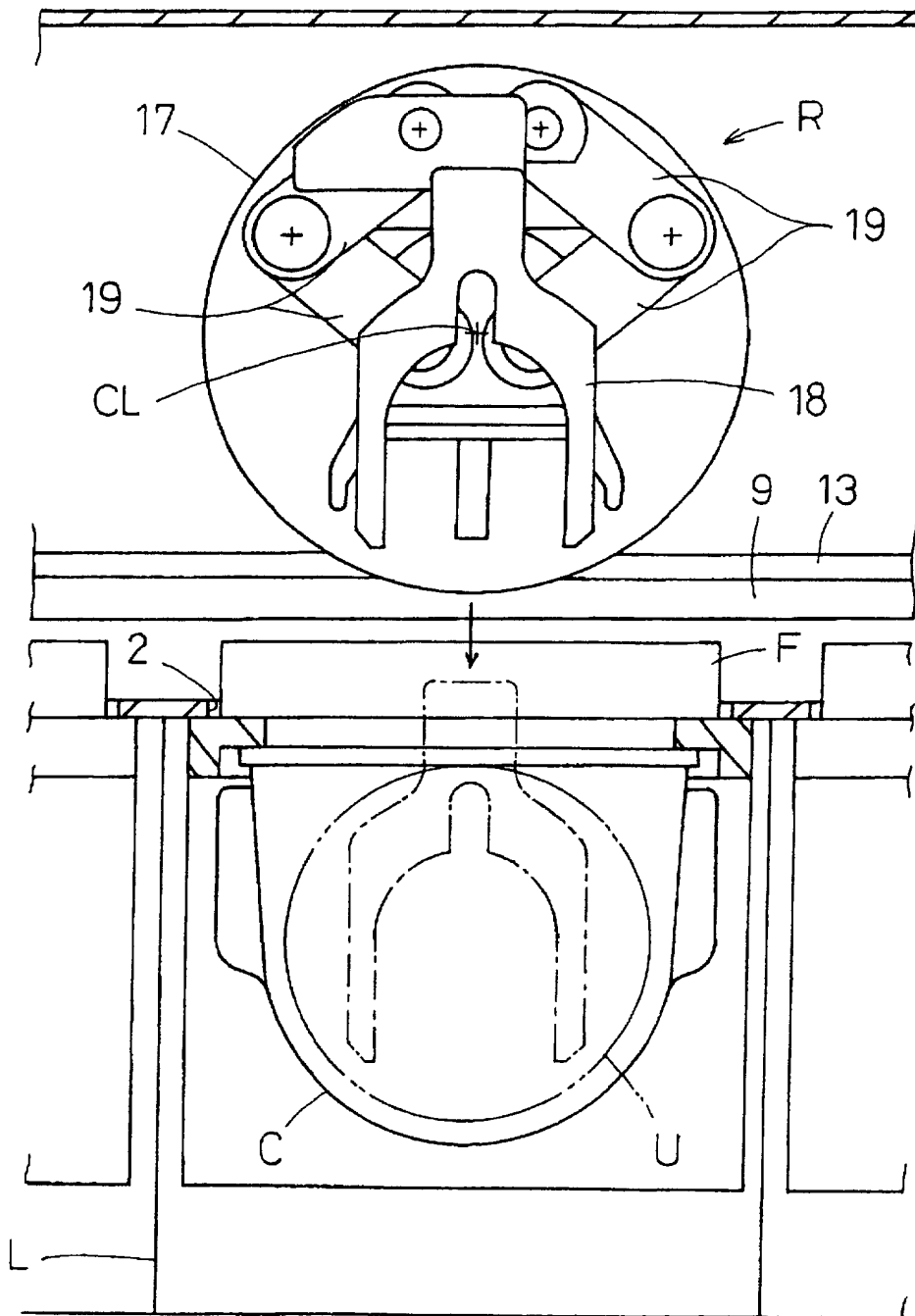


FIG. 5

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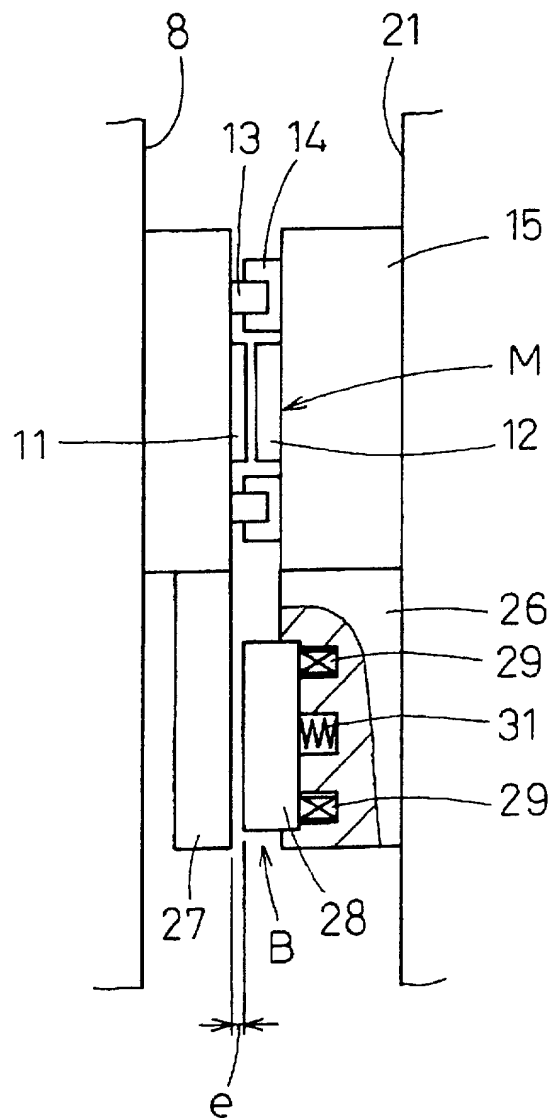


FIG. 6

FIG. 7

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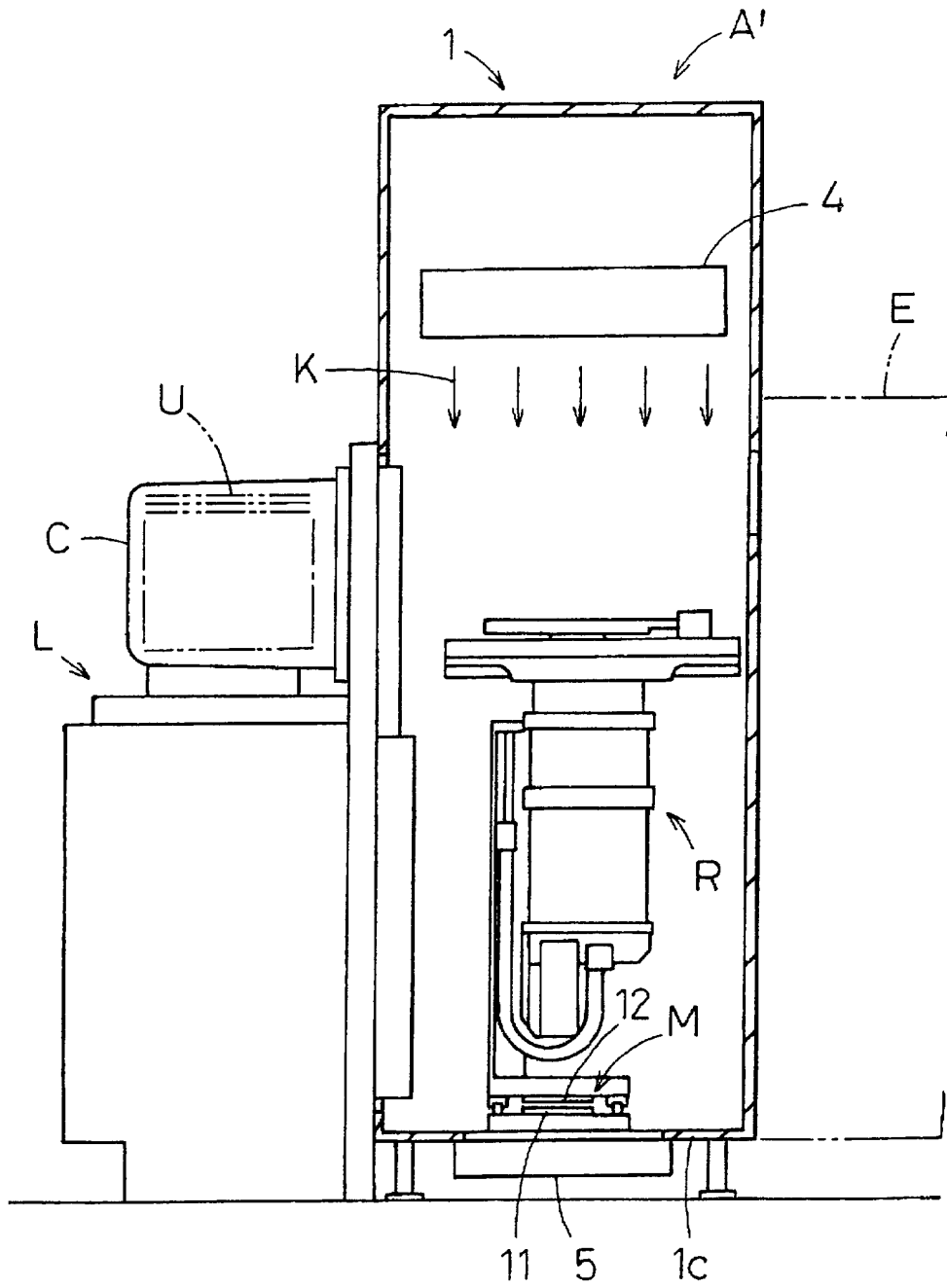


FIG. 8

33082R116

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Hiroaki Saeki, et al.

International Application No.: PCT/JP00/04987

International Filing Date: July 26, 2000

U.S. Serial No.: To Be Assigned

Group Art Unit: To Be Assigned

Filed: : January 25, 2002 (Herewith)

Examiner: To Be Assigned

PROPOSED DRAWING AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Submitted herewith for the Examiner's approval are two (2) sheets of drawings
containing red ink corrections to Figures 6 and 8.

Respectfully submitted,

SMITH, GAMBRELL & RUSSELL, LLP

By:



Dennis C. Rodgers, Reg. No. 32,936
1850 M Street, N.W., Suite 800
Washington, D.C. 20036
Telephone: (202) 263-4300
Fax: (202) 263-4329

Date: January 25, 2002

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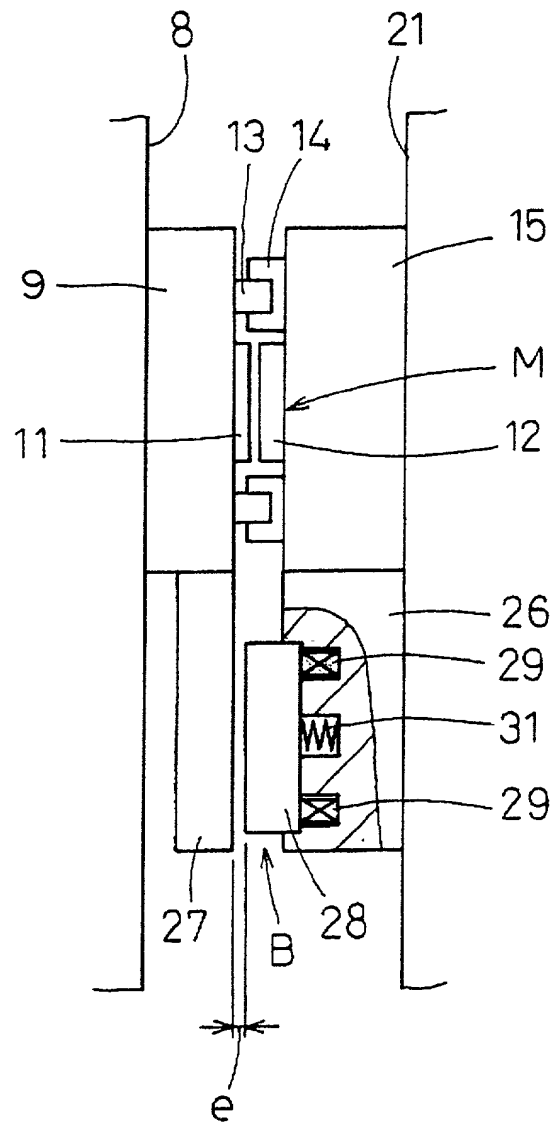
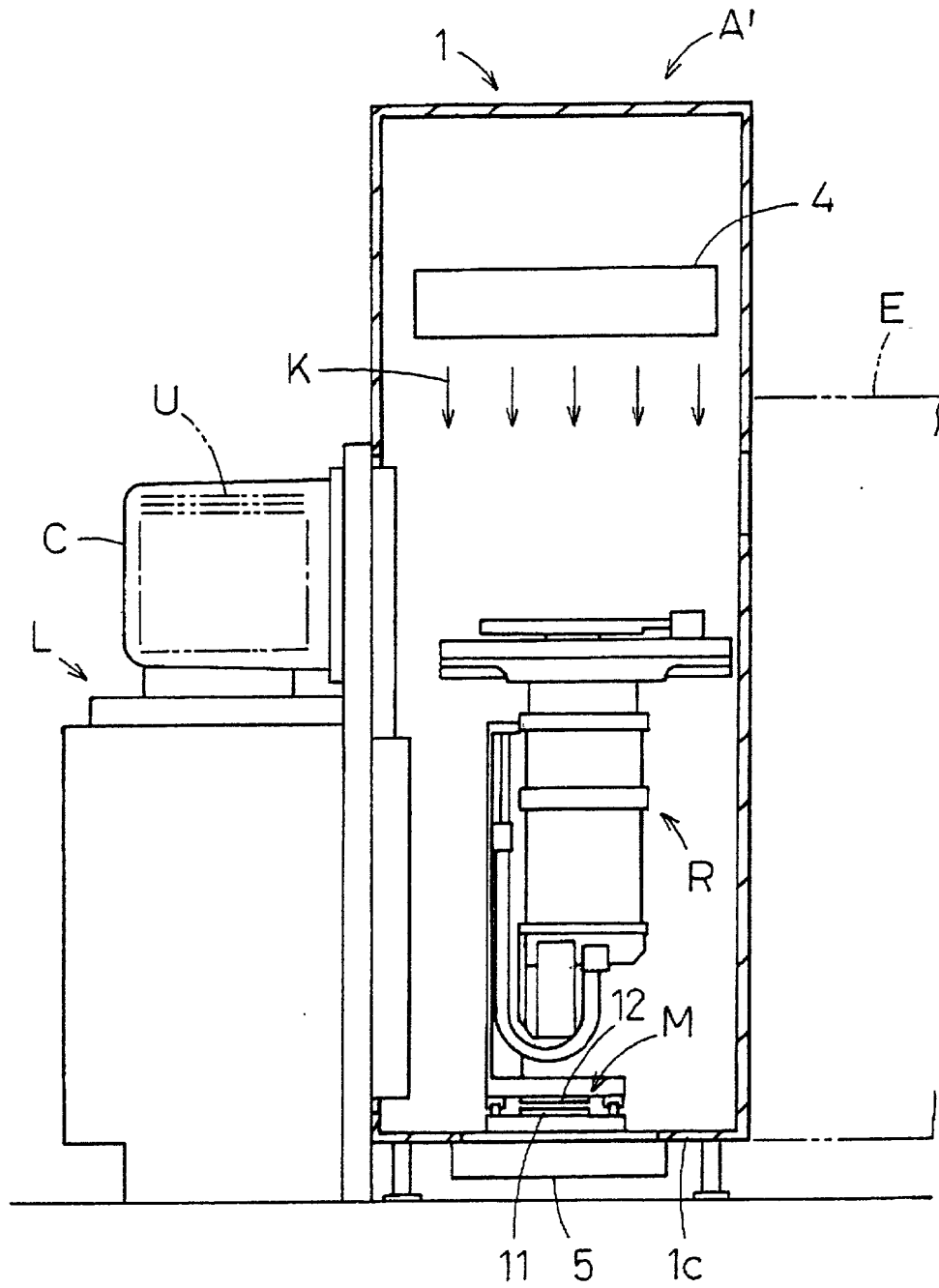


FIG. 6

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PRIOR ART
FIG. 8

33082R116

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant(s): Hiroaki Saeki, et al.

International Application No.: PCT/JP00/04987

International Filing Date: July 26, 2000

U.S. Serial No.: To Be Assigned

Group Art Unit: To Be Assigned

Filed: : January 25, 2002 (Herewith)

Examiner: To Be Assigned

FORMAL DRAWING TRANSMITTAL

Commissioner for Patents
Washington, D.C. 20231

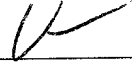
Sir:

Enclosed herewith are two (2) sheets of Formal Drawings. The formal/corrected drawing sheets incorporate the changes appearing in the proposed drawing amendment filed concurrently herewith.

Respectfully submitted,

SMITH, GAMBRELL & RUSSELL, LLP

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Date: January 25, 2002

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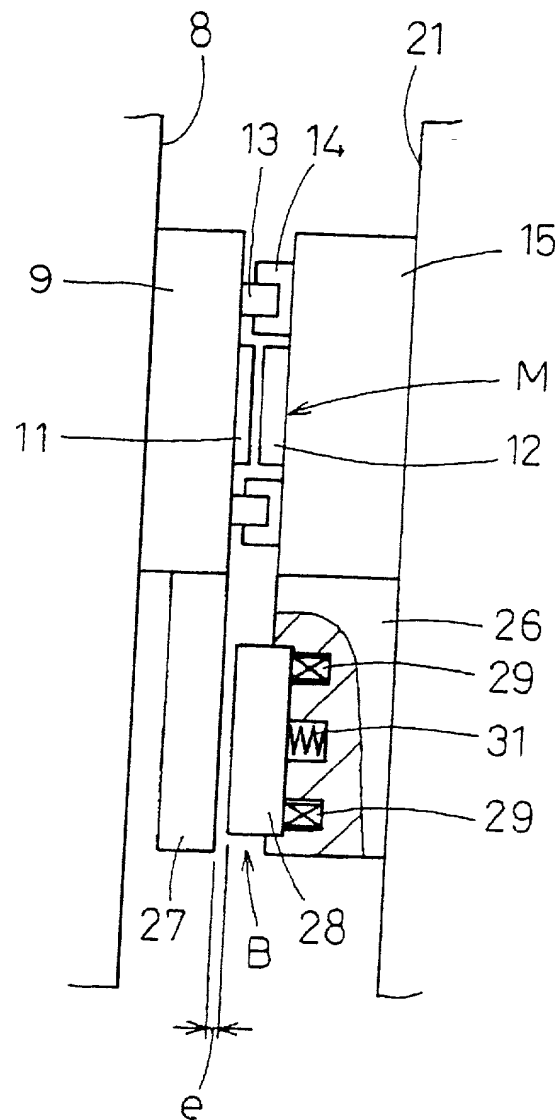
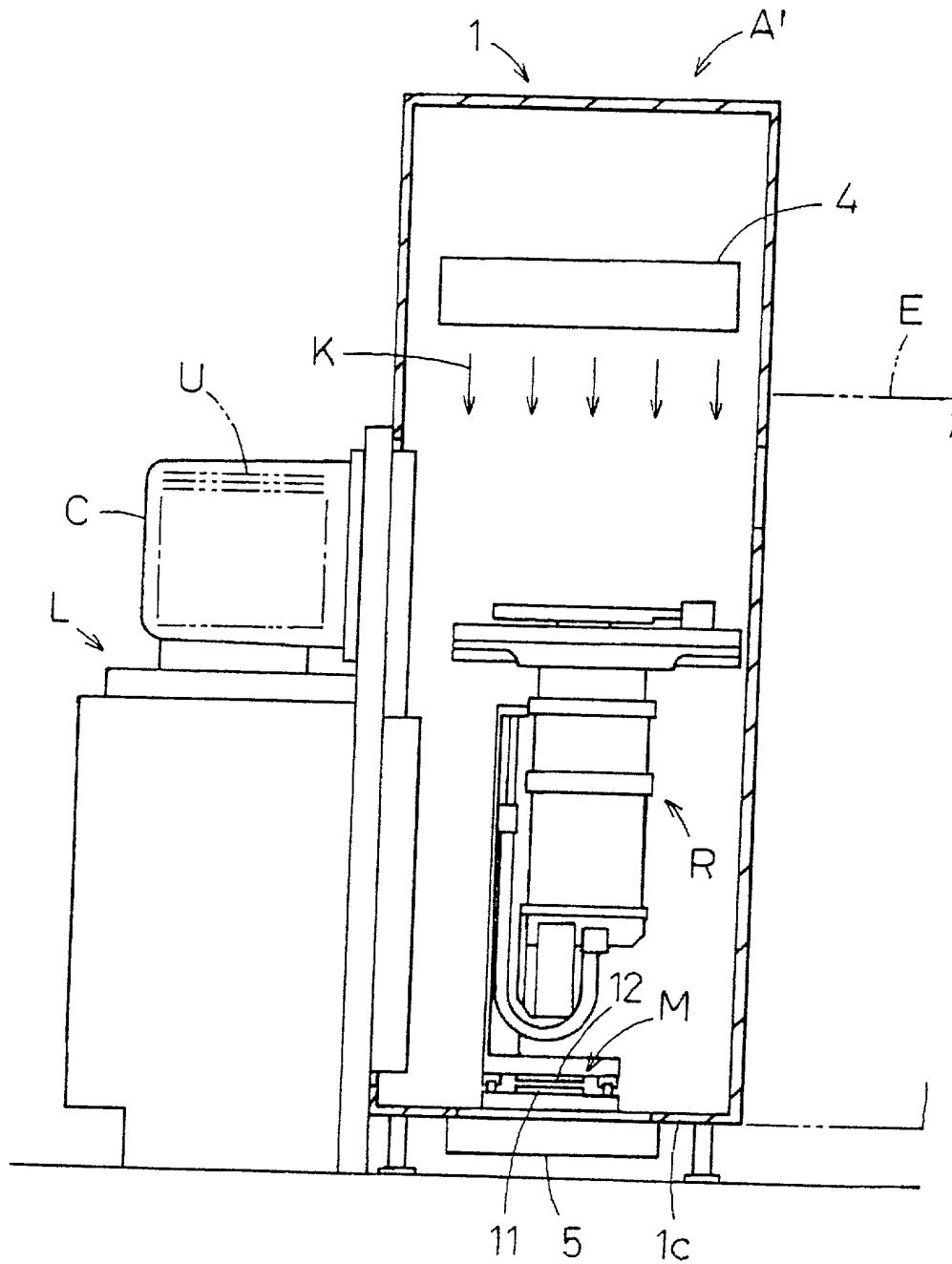


FIG. 6

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PRIOR ART
FIG. 8

Attorney's Ref. No.:

Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

私は、以下に記名された発明者として、ここに下記の通り宣言する:

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先そして国籍は、私の氏名の後に記載された通りである。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明について特許請求範囲に記載され、且つ特許が求められている発明主題に関して、私が最初、最先且つ唯一の発明者である（唯一の氏名が記載されている場合）か、或いは最初、最先且つ共同発明者である（複数の氏名が記載されている場合）と信じている。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

TRANSFER SYSTEM FOR OBJECT TO BE
PROCESSED, AND SEMICONDUCTOR
FABRICATING SYSTEM WITH SAME

上記発明の明細書はここに添付されているが、下記の欄がチェックされている場合は、この限りでない:

the specification of which is attached hereto unless the following box is checked:

☐ の日に出席され、

☒ was filed on 26/July/2000
as United States Application Number or
PCT International Application Number
PCT/JP00/04987 and was amended on June 15, 2001
(if applicable).

この出願の米国出願番号または PCT 出願番号は、

であり、且つ、

の日に訂正された出願（該当する場合）

私は、上記の補正書によって補正された、特許請求範囲を含む上記明細書を検討し、且つ内容を理解していることをここに表明する。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第 37 編規則 1.56 に定義されている、特許性について重要な情報を開示する義務があることを認める。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Burden Hour Statement: This form is estimated to take 0.4 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner of Patents and Trademarks, Washington, DC 20231

Japanese Language Declaration

(日本語宣言書)

私は、ここに、以下に記載した外国での特許出願または発明者証の出願、或いは米国以外の少なくとも一国を指定している米国法典第35編第365条(a)によるPCT国際出願について、同第119条(a)-(d)項又は第365条(b)項に基づいて優先権を主張するとともに、優先権を主張する本出願の出願日よりも前の出願日を有する外国での特許出願または発明者証の出願、或いはPCT国際出願については、いかなる出願も、下記の枠内をチェックすることにより示した。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)

外国での先行出願

Priority Not Claimed

優先権主張なし

11-210017

Japan

26/July/1999

(Number)

(Country)

(Day/Month/Year Filed)

(番号)

(国名)

(出願年月日)

(Number)

(Country)

(Day/Month/Year Filed)

(番号)

(国名)

(出願年月日)

私は、ここに、下記のいかなる米国仮特許出願についても、その米国法典第35編119条(e)項の利益を主張する。

I hereby claim the benefit under Title 35, United States Code, Section 119 (e) of any United States provisional application(s) listed below.

(Application No.)

(出願番号)

(Filing Date)

(出願日)

(Application No.)

(出願番号)

(Filing Date)

(出願日)

私は、ここに、下記のいかなる米国出願についても、その米国法典第35編第120条に基づく利益を主張し、又米国を指定するいかなるPCT国際出願についても、その同第365条(c)に基づく利益を主張する。また、本出願の各特許請求の範囲の主題が米国法典第35編第112条第1段に規定された態様で、先行する米国特許出願又はPCT国際出願に開示されていない場合においては、その先行出願の出願日と本国内出願日またはPCT国際出願日との間の期間中に入手された情報で、連邦規則法典第37編規則1.56に定義された特許性に関わる重要な情報について開示義務があることを承認する。

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or 365 (c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application:

(Application No.)

(出願番号)

(Filing Date)

(出願日)

(Status: Patented, Pending, Abandoned)

(現況: 特許許可済、係属中、放棄済)

(Application No.)

(出願番号)

(Filing Date)

(出願日)

(Status: Patented, Pending, Abandoned)

(現況: 特許許可済、係属中、放棄済)

私は、ここに表明された私自身の知識に係わる陳述が真実であり、且つ情報と信ずることに基づく陳述が、真実であると信じられることを宣言し、さらに、故意に虚偽の陳述などを行った場合は、米国法典第18編第1001条に基づき、罰金または拘禁、若しくはその両方により処罰され、またそのような故意による虚偽の陳述は、本出願またはそれに対して発行されるいかなる特許も、その有効性に問題が生ずることを理解した上で陳述が行われたことを、ここに宣言する。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration

(日本語宣言書)

委任状： 私は本出願を審査する手続を行い、且つ米国特許商標庁との全ての業務を遂行するために、記名された発明者として、下記の弁護士及び／または弁理士を任命する。(氏名及び登録番号を記載すること)

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Dale Lischer, Reg. 28438; Frederick F. Calvetti, Reg. 28557;

J. Rogers Lunsford, III, Reg. 29405; Michael A. Makuch, Reg. 32263;

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. (list name and registration number)

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Michael K. Carrier, Reg. 42391; Eric J. Hanson, Reg. 44738;

Patric R. Delaney, Reg. 45338; Brandon S. Boss, Reg. 46567,

Brett L. Nelson, Reg. 48,119

7

書類送付先:

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Smith, Gambrell & Russell, LLP, Beveridge, DeGrandi, Weilacher
& Young Intellectual Property Group
(202) 659-2811

唯一または第一発明者名

Full name of sole or first inventor

Hiroaki Saeki

発明者の署名

日付

Inventor's signature

Date Jan. 22, 2002

Hiroaki Saeki

住所

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Residence

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国籍

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Citizenship

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Second inventor's signature

Date Jan. 16, 2002

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日本

Citizenship

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(第三以降の共同発明者についても同様に記載し、署名をすること)

(Supply similar information and signature for third and subsequent joint inventors.)

Under the Paperwork Reduction Act of 1995, no persons are required to respond to collection of information unless it displays a valid OMB control number.

Japanese Language Declaration

(日本語宣言書)

第三共同発明者		Full name of third joint inventor, if any Tetsu Osawa	
第三共同発明者の署名	日付	Third inventor's signature Tetsu Osawa	Date Jan. 22, 2002
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国籍 日本		Citizenship Japan	
私書箱		Post Office Address 4959-9, Tana, Sagami-hara-Shi, Kanagawa-Ken, Japan	
第四共同発明者		Full name of fourth joint inventor, if any Yasushi Taniyama	
第四共同発明者の署名	日付	Fourth inventor's signature Yasushi Taniyama	Date Jan. 22, 2002
住所 日本国,		Residence Toyohashi-Shi, Aichi-Ken, Japan	JPX
国籍 日本		Citizenship Japan	
私書箱		Post Office Address c/o Shinko Electric Co., Ltd., Toyohashi Works, 150, Aza-Motoyashiki, Mitsuya-Cho, Toyohashi-Shi, Aichi-Ken, Japan	
第五共同発明者		Full name of fifth joint inventor, if any Shuui Hagiwara	
第五共同発明者の署名	日付	Fifth inventor's signature Shuui Hagiwara	Date Jan. 22, 2002
住所 日本国,		Residence Toyohashi-Shi, Aichi-Ken, Japan	JPX
国籍 日本		Citizenship Japan	
私書箱		Post Office Address c/o Shinko Electric Co., Ltd., Toyohashi Works, 150, Aza-Motoyashiki, Mitsuya-Cho, Toyohashi-Shi, Aichi-Ken, Japan	
第六共同発明者		Full name of sixth joint inventor, if any	
第六共同発明者の署名	日付	Sixth inventor's signature	Date
住所		Residence	
国籍		Citizenship	
私書箱		Post Office Address	
(第七以降の共同発明者についても同様に記載し、署名をすること)		(Supply similar information and signature for seventh and subsequent joint inventors.)	